1262111

# URS OPERATING SERVICES

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December 6, 2011

Ms. Sabrina Forrest
U.S. Environmental Protection Agency, Region 8
Mail Code: 8EPR-B
1595 Wynkoop Street
Denver, Colorado 80202-1129

**SUBJECT: START 3, EPA Region 8, Contract No. EP-W-05-050, TDD No. 1008-13 Trip Report-Revision 1-for August 2011 Sampling and Field Activities, Upper Animas Mining District, Silverton, San Juan County, Colorado**

Dear Ms. Forrest:

Attached is one copy of the revised draft trip report for sampling and field activities conducted for the Upper Animas Mining District Site Reassessment. Field activities were conducted the week of August 22, 2011 and included source sample collection from the Gold King 7 Level Mine waste pile and calculation of the waste pile volume, evaluation of mineralogy in source mine waste piles, documentation of the surface water pathway from all identified sources, field documentation of fishing along the Animas River south of Silverton, and wetlands delineation and sensitive environment characterization on Cement Creek. The wetlands delineation and sensitive environment report will be submitted as a separate document.

This document is submitted for your review and comments.

If you have any questions, please call me at 303-291-8270.

Sincerely,

**URS OPERATING SERVICES, INC.**

Barry Hayhurst
Environmental Scientist

cc: Megan Adamczyk, Project Manager
Charles W. Baker/UOS (w/o attachment)
File/UOS

**EPA ACTION BLOCK**

- (X) Approved
- ( ) Approved, TDD to follow
- ( ) Approved as corrected
- ( ) Disapproved
- ( ) Review with _____
- ( ) Original to _____
- ( ) Copy to _____
- ( ) Reply envelope enclosed

12/07/11 _____
Date By

**TRIP REPORT**
**Upper Animas Mining District**
**Silverton, San Juan County, Colorado**

## 1.0 INTRODUCTION

URS Operating Services, Inc. (UOS), was tasked by the Environmental Protection Agency (EPA), under Superfund Technical Assessment and Response Team 3 (START) contract # EP-W-05-050 Technical Direction Document (TDD) No. 1008-13, to conduct a site reassessment (SR) at the Upper Animas Mining District site. Specifically, START was tasked to collect additional samples and surface water pathway documentation in August 2011. These field activities were conducted in accordance with the approved Addendum to the approved Field Sampling Plan (FSP) – Supplemental Sampling (UOS 2011a).

Four source soil samples were collected from the Gold King 7 Level Mine waste pile and submitted for contract laboratory program (CLP) analysis for total target analyte list (TAL) metals. The results are presented in Table 1, and Laboratory Form 1s are presented in Appendix B. Geographic positioning system (GPS) coordinates were collected to estimate a volume for the mine waste pile. In addition, the mineralogy of the mine waste piles at the identified sources at the Grand Mogul Mine, Mogul Mine, Red and Bonita Mine, and Gold King 7 Level Mine was characterized to determine if sufficient mineralogical similarities existed to justify grouping the four sources together.

The surface water pathways from each of the sources at Grand Mogul Mine, Mogul Mine, Red and Bonita Mine, Gold King 7 Level Mine, and American Tunnel were documented. The results for the survey are presented in this report and illustrated in Figure 1 and the Photolog attached in Appendix A.

Fishing along the Animas River downstream of the confluence of Cement Creek with the Animas River was investigated along the 15-mile target distance limit (TDL) as far as Elk Park, and the results are presented in this report and the Photolog attached in Appendix A.

Wetlands delineation and sensitive environment characterization along Cement Creek between the Grand Mogul Mine and Ohio Gulch were conducted by experts, and a report of the results will be presented in a separate Wetlands Delineation and Sensitive Environment Characterization Report.

A copy of the field logbook is included as Appendix C.

## 2.0 BACKGROUND

The site is located in Silverton, San Juan County, Colorado and is made up of publically and privately owned parcels. The investigation focused on the Animas River between U.S. Geological Survey (USGS) gauging stations A72 and A68, Mineral Creek immediately upstream of the Animas River, Cement Creek, and tributaries to Cement Creek (Figure 1) (UOS 2010).

Mines in the Silverton area operated between the years 1874 and 1991. Mining activities in the Upper Animas basin, including Cement Creek, produced the mine waste and mill tailings sources from which contamination spread throughout the surface water pathway. This site reassessment focused on Cement Creek, a major source of metals contamination to the Animas River.

Thirty-three individual sources of mine wastes and mill tailings have been identified in the Cement Creek drainage, totaling approximately 188,000 cubic yards (UOS 2009). Several investigations have been conducted in the Cement Creek basin by the Colorado Department of Public Health and the Environment (CDPHE), but data were not appropriate for evaluating the site based on Hazard Ranking system (HRS) criteria. Several sources of mine and mill waste have been reclaimed to some degree through work carried out by the Bureau of Land Management (BLM), the CDPHE, the Colorado Division of Reclamation Mining and Safety (DRMS), and the Animas River Stakeholders Group (ARSG). The reclaimed waste areas are primarily in gulches that feed into lower Cement Creek. Most of the sources of mine wastes in the Upper Cement Creek basin remain in place. The wastes are rich in arsenic, cadmium, copper, lead, manganese, and zinc.

During the October 2010 sampling event, START collected adit discharge and adit sediment samples from all of the five identified adit sources and waste mine  samples from the mine waste piles of three of the identified sources (Grand Mogul, Mogul, and Red and Bonita mines). Environmental samples of surface water and sediment were also collected from Cement Creek and used to characterize the impact of these sources on Cement Creek, and also the impact of Cement Creek on the Animas River.

During the August 2011 field effort, data gaps identified in the Analytical Results Report (ARR) of the 2010 site reassessment were addressed. These activities included the collection of samples of the Gold King 7 Level Mine mine waste pile and collection of GPS data to calculate a volume of the mine waste pile; comparison of mineralogy of the mine waste piles at the four source areas with mine waste piles; documentation of the surface water pathway from each of the five sources to the probable point of entry (PPE) into Cement Creek; delineation of wetlands and characterization of sensitive environments along

Cement Creek; and documentation of fishing and other recreational activity along the Animas River south of Silverton.

The purpose of these supplemental field activities was to assist Region 8 EPA personnel in gathering data to determine whether this site should be considered for National Priority List (NPL) listing.

## 3.0 SITE ACTIVITIES

START members Barry Hayhurst and Jeff Miller mobilized to Silverton, Colorado on August 21, 2011. Field activities began on Monday, August 22, 2011 and included:

- Wetlands delineation and sensitive environment characterization of Cement Creek between the Grand Mogul Mine and Ohio Gulch;
- Collection of four source samples from the mine waste pile at the Gold King 7 Level Mine;
- Collection of GPS coordinates to calculate a volume for the Gold King 7 Level Mine mine waste pile;
- Characterization of mineralization and documentation of similarity of mineralogy to determine if all identified mine waste pile sources could be combined as a single source;
- Documentation of the surface water pathway from all the sources identified in the 2010 field sampling event; and
- Field documentation of fishing and other recreational activity along the Animas River to the 15-mile TDL downstream of the confluence of Cement Creek with the Animas River;

The Photolog of site activities is provided in Appendix A.

### 3.1 SAMPLING AND ANALYSIS

Source samples were collected for TAL total metals analysis. All of the source samples were collected in accordance with procedures described in UOS TSOP 4.16, “Surface and Shallow Depth Soil Sampling” (UOS 2005). Dedicated, disposable plastic scoops were used for source sample collection. All source samples were collected as biased grab samples from the 6- to 12-inch depth interval. A sharp shooter shovel was used to accomplish the depth needed for the sample and was decontaminated between samples. Source samples for total metals analysis were placed in 8-ounce high density polyethylene (HDPE) jars. All samples were labeled with the sample identification number and stored in a cooler on ice pending shipping to the laboratory.

Sample descriptions were logged in the field log book. A GPS point and photograph were collected for each sample location.

The Gold King 7 Level Mine mine waste pile was first screened using a Innov-X Systems Model OSD-4000 portable X-ray fluorescence (XRF) instrument (Appendix A, Photo 8). Twelve field readings identified three different types of mine waste:

- a medium-grained orange colored material,
- a fine-grained limonite colored material, and
- a fine-to-coarse grained material with large concentrations of quartz and sulfides.

Four samples of the mine waste pile at the Gold King 7 Level Mine were collected in accordance with the approved FSP. Sample UASO015 was collected from an area that was being actively eroded by the North Fork of Cement Creek, from material that appeared to be similar to the fine-grained limonite colored material (Appendix A, Photo 7). START personnel also collected source samples from each of the three types of mine waste material identified with the field XRF. One Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample was collected with the sample from location UASO018.

Source samples for TAL total metals analysis were shipped via FedEx to Sentinel Inc. in Huntsville, Alabama where they were received in good condition with custody seals intact.

Sample results are shown in Table 1 and sample locations are shown in Figure 1.

## 3.2 CALCULATION OF VOLUME OF GOLD KING 7 LEVEL MINE WASTE PILE

GIS coordinates were collected to calculate the volume of the Gold King 7 Level Mine mine waste pile. The dimensions collected were a flat area on top of the mine waste pile measuring approximately 60 feet by 100 feet, a mine waste pile height of approximately 70 feet with a slope of approximately 32 degrees and, a lower dimension greater than 220 feet with a feather thin layer of mine waste  less than 1 foot thick. Converting these dimensions to a slab averaging 30 feet thick, 70 feet wide, and 160 feet long [(100 + 220)/2] the volume of the mine waste pile is estimated to be a minimum of 12,500 cubic yards.

## 3.3 MINERALOGICAL COMPARISON

The mineralogy of quartz-sulfide ore was found in all the mine waste piles at the Grand Mogul, Mogul, Red and Bonita, and Gold King 7 Level mines. This observation conforms to the geologic description of the ores found in the USGS Professional Paper 1651, Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado, Chapters E-1 Geologic Framework and E-3 Major Styles of Mineralization and Hydrothermal Alteration and Related Solid- and Aqueous-Phase Geochemical Signatures (USGS 2007).

## 3.4 DOCUMENTATION OF SURFACE WATER PATHWAY

The surface water overland flow pathway from each of the five identified sources was documented in the field by walking the distance from the adit discharge to the PPE. All mine wastes that come into contact with surface water were documented, and Figure 1 was prepared showing all source samples and the PPE to Cement Creek from each source.

- **Grand Mogul Mine**: The overland flow pathway for the Grand Mogul Mine begins at the western toe of the main mine waste pile and continues westward for approximately 300 feet until it enters Cement Creek (Appendix A, Photos 1 & 2). The actual point of exit from the ground is buried by the mine waste. The overland flow path as shown in Photo 1 is heavily stained with iron oxides (that begin to precipitate out of solution when the pH rises above 3.5) as compared to the stream course of Cement Creek on the left center of the photograph.
- **Mogul Mine**: The discharge from the Mogul exits through an adit on the northeast side of the mine waste pile and flows across the top of the mine waste pile in a tarp lined ditch to the access road. Once the adit discharge crosses the road, it flows over a mixture of mine waste and mine trash into a series of wetlands below the mine (Appendix A, Photo 3). The overland flow pathway from the Mogul Mine covers approximately 1,200 feet before the PPE into Cement Creek. It can be observed that iron oxides are precipitating on the side of Cement Creek where discharge water from the Mogul Mine is entering Cement Creek (Appendix A, Photo 4).
- **Red and Bonita Mine**: The discharge from the Red and Bonita Mine exits from an adit on top of the mine waste pile and flows over the mine waste pile to a ditch between the base of the mine waste pile and an access road to the south end of the mine waste pile

where it flows southward, then into a culvert directed westward under the road, and then directly westward across a barren iron oxide stained landscape to Cement Creek (Appendix A, Photo 5). The overland flow path after flowing under the road splits into two streams in the barren area before entering Cement Creek. The more upstream flow path was visually estimated to carry approximately 75 percent of the flow, and the smaller stream enters Cement Creek approximately 50 feet downstream of the larger stream. Photo 6 shows the upper dominant discharge point. Note the iron oxide staining in the Cement Creek streambed on the side of the PPE from the Red and Bonita Mine (Appendix A, Photo 6).

The surface of the Red and Bonita mine waste pile has been covered with an armor of iron oxides that have cemented the surface material together. It is unknown if the armor prevents percolation of water through the mine waste pile.

- **Gold King 7 Level Mine**: There are two adit discharges at the top of the Gold King 7 Level Mine mine waste pile. The main discharge on the east side of the pile is channelized into a segmented plastic channel to flow down to the North Fork of Cement Creek just beyond the east side of the mine waste pile. The smaller western discharge is not provided with any engineering controls and flows westward eventually percolating through the mine waste pile into the North Fork of Cement Creek. The North Fork of Cement Creek is actively eroding the mine waste pile, and evidence of sloughing and erosional rills were observed in the mine waste pile (Appendix A, Photo 7). The North Fork of Cement Creek flows approximately 1,500 feet westward from the toe of the Gold King 7 Level Mine mine waste pile to the PPE with Cement Creek. Iron oxide precipitation in the Cement Creek streambed below the confluence of Cement Creek and the North Fork of Cement Creek is pronounced (Appendix A, Photo 9).
- **American Tunnel**: The discharge point for the American Tunnel is found just upstream of Gladstone where the discharge emerges from the diversion structure and flows approximately 200 feet westward to its PPE with Cement Creek. Strong iron oxide precipitate staining of the discharge and Cement Creek below the PPE was observed in August 2011 (Appendix A, Photo 10).

## 3.5 WETLANDS DELINEATION AND SENSITIVE ENVIRONMENT CHARACTERIZATION

A team of experts delineated streamside wetlands that conformed to the definition of 40 CFR 230.3 along Cement Creek from the Grand Mogul Mine downstream to Ohio Gulch. The expert team also evaluated the stretch of Cement Creek between the Grand Mogul Mine and Ohio Gulch for sensitive environments and threatened and endangered species applicable to the HRS scoring of the site. The team identified four segments of continuous stream side wetlands totaling 0.1 miles or longer and numerous shorter segments. One of the wetlands segments (WL10-1) is located directly below the Mogul Mine and is measured to contain 1,062 feet of streamside wetlands. The total of documented wetlands on Cement Creek between the Grand Mogul Mine and Ohio Gulch is estimated to be greater than one mile. No sensitive environments or threatened and endangered species directly associated with Cement Creek were documented during the field study. The results of the wetlands delineation and sensitive environment investigation will be presented as a separate report.

## 3.6 INVESTIGATION OF FISHING AND OTHER RECREATIONAL ACTIVITIES ALONG THE ANIMAS RIVER SOUTH OF SILVERTON, COLORADO

START investigated the potential fishing activity along the Animas River downstream of the confluence of Cement Creek with the Animas River, south of Silverton, Colorado. Elk Park, an open area in the Animas River Canyon where the State of Colorado performs fish count studies every 5 years, was investigated. A fishing lure was found in a tree along the river bank, but no fishermen were observed during the investigation (Appendix A, Photos 11 and 12). The Colorado Trail passes through Elk Park and the area is also used for camping. No evidence of river rafting was observed during the site reconnaissance.

Frank Cianci, a conductor on the Durango and Silverton Narrow Gauge Railroad for the past 21 years, recounted that once he dropped off a family in Elk Park who planned to fish there. Mr. Cianci also related that he had seen people fishing along the stretch of the Animas River between Silverton and Elk Park five or six times (UOS 2011b [Appendix D]). The Durango and Silverton Narrow Gauge Railroad regularly stops in Elk Park for fishermen and campers.

Ron Dewitz and volunteer with the Forest Service Public Land Center in Silverton related that he occasionally heard of someone catching a fish on the Animas River south of Silverton, but he did

not personally know anyone who had caught a fish in that stretch of the river (UOS 2011b [Appendix D]).

## 4.0 LIST OF REFERENCES

URS Operating Services, Inc. (UOS). 2005. "Technical Standard Operating Procedures for the Superfund Technical Assessment and Response Team (START), EPA Region 8." September 2005.

URS Operating Services, Inc. (UOS). 2009. "Data Gap Analysis Report for Targeted National Priority Listing: Upper Animas Mining District San Juan County Colorado." October 13, 2009.

URS Operating Services, Inc. (UOS). 2010. "Field Sampling Plan: Upper Animas Mining District San Juan County Colorado." October 21, 2010.

URS Operating Services, Inc. (UOS). 2011a. "Addendum to the approved Field Sampling Plan-Supplemental Sampling: Upper Animas Mining District San Juan County Colorado." August 18, 2011.

URS Operating Services, Inc. (UOS). 2011b. Upper Animas-Cement Creek Field Work-August, 2011. Field notebook by B. Hayhurst. August 2011.

U.S. Geological Survey Professional Paper 1651. 2007. Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado. 2007.

**Table 1**
**Gold King 7 Level Mine Waste Source Samples**

| Field Sample ID:<br>Location:<br>Analytes | Superfund Chemical Data Matrix (SCDM) Soil Exposure Pathway NCRSC<br>(mg/kg) | Superfund Chemical Data Matrix (SCDM) Soil Exposure Pathway CRSC<br>(mg/kg) | UASO015 MH30H7<br>Gold King 7 Level Mine waste pile being eroded by North Fork Cement Creek<br>(mg/kg) | UASO016 MH30H8<br>Gold King 7 Level Mine orange limonite-stained mine waste<br>(mg/kg) | UASO017 MH30H9<br>Gold King 7 Level Mine yellow limonite-stained medium- to fine-grained mine waste<br>(mg/kg) | UASO018 MH30J0<br>Gold King 7 Level Mine medium- to coarse-grained white quartz and sulfides MS/MSD<br>(mg/kg) |
|---|---|---|---|---|---|---|
| Aluminum | – | – | 1190 | 1970 | 1010 | 1010 |
| Antimony | 31 | – | 3.8 J | 1.6 J | 3.6 J | 3.5 J |
| Arsenic | 23 | 0.43 | **16.8** | **18.1** | **7.5** | **4.7** |
| Barium | 5,500 | – | 34.1 | 115 | 28.4 | 23.8 |
| Beryllium | 160 | – | 0.060 J | 0.077 J | 0.083 J | 0.060 J |
| Cadmium | 39 | – | 0.35 J | 1.4 | 0.43 J | 0.83 |
| Calcium | – | – | 195 J | 126 J | 133 J | 110 J |
| Chromium | 230 | – | 0.77 J | 1.8 | 0.64 J | 0.50 J |
| Cobalt | – | – | 0.35 J | 1.0 J | 1.1 J | 0.29 J |
| Copper | – | – | 47.5 | 67.2 | 84.2 | 192 |
| Iron | – | – | 13100 | 32900 | 11300 | 9680 |
| Lead | – | – | 773 | 1250 | 1500 | 454 |
| Magnesium | – | – | 282 J | 397 J | 146 J | 313 J |
| Manganese | 11,000 | – | 69.6 | 171 | 91.2 | 49 |
| Nickel | 1600 | – | 0.46 J | 0.76 J | 0.80 J | 0.25 J |
| Potassium | – | – | 973 | 3320 | 844 | 810 |
| Selenium | 390 | – | 2.5 J | 8.1 | 1.9 J | 2.1 J |

## Table 1
## Gold King 7 Level Mine Waste Source Samples

| Field Sample ID:<br>Location:<br>Analytes | Superfund Chemical Data Matrix (SCDM) Soil Exposure Pathway NCRSC<br>(mg/kg) | Superfund Chemical Data Matrix (SCDM) Soil Exposure Pathway CRSC<br>(mg/kg) | UASO015 MH30H7<br>Gold King 7 Level Mine waste pile being eroded by North Fork Cement Creek<br>(mg/kg) | UASO016 MH30H8<br>Gold King 7 Level Mine orange limonite-stained mine waste<br>(mg/kg) | UASO017 MH30H9<br>Gold King 7 Level Mine yellow limonite-stained medium- to fine-grained mine waste<br>(mg/kg) | UASO018 MH30J0<br>Gold King 7 Level Mine medium- to coarse-grained white quartz and sulfides MS/MSD<br>(mg/kg) |
|---|---|---|---|---|---|---|
| Silver | 390 | – | 6.7 | 5.8 | 10.1 | 7.3 |
| Sodium | – | – | 161 J | 196 J | 173 J | 140 J |
| Thallium | – | – | 2.8 U | 2.8 U | 2.7 U | 2.7 U |
| Vanadium | 550 | – | 6.7 | 11.2 | 5.6 | 2.9 J |
| Zinc | 23,000 | – | 45 | 399 | 89.3 | 186 |

J The associated numerical value is an estimated quantity because quality control criteria were not met. Presence of the element is reliable.
U The analyte was not detected at or above the Contract Required Detection Limit (CRDL).
NCRSC Non Cancer Risk Screening Concentration
CRSC Cancer Risk Screening Concentration
mg/kg milligrams per kilograms
**BOLD** Greater than SCDM benchmark


Figure 1
**Upper Cement Creek Source Locations**

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# APPENDIX A

## Photo Log
## Cement Creek
## San Juan County, Colorado
## August 2011

**PHOTO 1**
View to the west of surface water flowing from the toe of the Grand Mogul Mine waste rock dumps toward Cement Creek. Note iron staining of flow path.

**PHOTO 2**
View to the east of the PPE from the Grand Mogul Mine into Cement Creek. Note iron staining of rocks in Cement Creek downstream of flow from Grand Mogul Mine. J. Miller of START at PPE collecting GPS location data.

**PHOTO 3**
View to the southwest showing adit discharge water from the Mogul Mine flowing over mine waste rock into wetlands immediately downstream of Mogul Mine waste rock. Note the mix of scrap lumber and waste rock. Note staining of flow path into wetlands. Cement Creek is at the shallow part of the valley in the background.

**PHOTO 4**
View to the east of the PPE of the discharge from the Mogul Mine into Cement Creek. The surface water pathway from the adit flows down to the road on the other side of the white patch of waste rock and through the wetlands. Note iron staining of Cement Creek on the inflow side of the creek from the PPE where J. Miller of START at PPE collecting GPS location data.

**PHOTO 5**
View to the west of the adit discharge from the Red and Bonita Mine. Note the strong color of iron oxide precipitation and the staining to Cement Creek along valley floor.

**PHOTO 6**
PPE from the adit discharge at the Red and Bonita Mine to Cement Creek. Note iron oxide staining on the same side of the Cement Creek as the PPE discharge point. J. Miller of START at PPE collecting GPS location data.

**PHOTO 7**
Gold King 7 Level Mine waste rock pile being eroded by the North Fork of Cement Creek. Note the erosion rills on the waste rock pile and undercutting by stream. J. Miller of START collects source sample UASO015 GPS coordinates.

**PHOTO 8**
Gold King 7 Level Mine waste rock pile. J. Miller of START collecting field XRF data from sample location UASO019.

**PHOTO 9**
Cement Creek immediately downstream of confluence with N. Fork of Cement Creek draining from Gold King 7 Level Mine. J. Miller of START at PPE collecting GPS coordinates.

**PHOTO 10**
PPE from the American Tunnel outlet entering into Cement Creek. Note strong iron oxide staining downstream of PPE.

**PHOTO 11**
Elk Park is an open area in the Animas River Canyon below Silverton where the State of Colorado conducts electroshocking and passengers from the Durango & Silverton Narrow Gauge Railroad are dropped off to fish the Animas River. Access is also gained from Molas Lake via the Colorado Trail which crosses the Animas River in Elk Park.

**PHOTO 12**
A fishing lure found imbedded on a tree limb along the banks of the Animas River in Elk Park. Lure is bright green on larger limb near the trunk.

# APPENDIX B

## Laboratory Form I Data Sheets and Chain of Custody Form

CASE # 41730

START, Denver, CO

EPA Contract Number: EP-W-05-050

**CHAIN OF CUSTODY RECORD**

Site #: 36548983

Contact Name: Barry Hayhurst

Contact Phone: 303-291-8270

**No: 085M-09/01/11-0008**

Lab: Sentinel Inc.

Lab Contact: Attn: Beverly Kilgore

Lab Phone: 2565349800

| Lab # | CLP Sample # | Sample # | Location | Analyses | Matrix | Collected | Sample Time | Numb Cont | Container | Preservative | MS/MSD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MH30H7 | UASO015 | UASO015 | Metals - No Hg | Soil | 8/25/2011 | 17:50 | 1 | 8oz Poly | 4 C | N |
| | MH30H8 | UASO016 | UASO016 | Metals - No Hg | Soil | 8/25/2011 | 18:05 | 1 | 8oz Poly | 4 C | N |
| | MH30H9 | UASO017 | UASO017 | Metals - No Hg | Soil | 8/25/2011 | 18:15 | 1 | 8oz Poly | 4 C | N |
| | MH30J0 | UASO018 | UASO018 | Metals - No Hg | Soil | 8/25/2011 | 18:30 | 2 | 8oz Poly | 4 C | Y |

Special Instructions: Case is Complete

Temp Blank = 6.9°C

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY # NA

| Items/Reason | Relinquished by | Date | Received by | Date | Time | Items/Reason | Relinquished By | Date | Received by | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 8/29/11 | Fed Ex | | | | | | | | |
| | | | | 9-2-11 | 0853 | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

9/2/11 8

USEPA - CLP

COVER PAGE

Lab Name: Sentinel Contract: EPW09040

Lab Code: SENTIN Case No.: 41730 Mod. Ref. No. SDG No.: MH30H7

SOW No.: ISM01.2

| EPA SAMPLE NO. | Lab Sample ID. |
|---|---|
| MH30H7 | 16155 |
| MH30H8 | 16156 |
| MH30H9 | 16157 |
| MH30J0 | 16158 |
| MH30J0D | 16158S2 |
| MH30J0S | 16158MS |

| | | ICP-AES | ICP-MS |
|---|---|---|---|
| Were ICP-AES and ICP-MS interelement corrections applied? | (Yes/No) | YES | |
| Were ICP-AES and ICP-MS background corrections applied? | (Yes/No) | YES | |
| If yes-were raw data generated before application of background corrections? | (Yes/No) | YES | |

The laboratory did not receive any instructions with this SDG to modify the SOW standard laboratory sample preparation procedures (e.g., subsampling). To aid in the determination of data usability with respect to project decisions, any modifications performed are described below.

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy Sample Data Package and in the electronic data submitted has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: _____ Name: B Kilgore

Date: 9/7/11 Title: QA Dir

9/7/11

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MH30H7

Lab Name: Sentinel  Contract: EPW09040

Lab Code: SENTIN  Case No.: 41730  Mod. Ref. No.  SDG No.: MH30H7

Matrix: (soil/water) SOIL  Lab Sample ID: 16155

% Solids: 90.0  Date Received: 09/02/2011

Concentration Units (ug/L, ug, or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 1190 | | *E | P |
| 7440-36-0 | Antimony | 3.8 | J | NE | P |
| 7440-38-2 | Arsenic | 16.8 | | | P |
| 7440-39-3 | Barium | 34.1 | | E | P |
| 7440-41-7 | Beryllium | 0.060 | J | | P |
| 7440-43-9 | Cadmium | 0.35 | J | * | P |
| 7440-70-2 | Calcium | 195 | J | | P |
| 7440-47-3 | Chromium | 0.77 | J | | P |
| 7440-48-4 | Cobalt | 0.35 | J | | P |
| 7440-50-8 | Copper | 47.5 | | N*E | P |
| 7439-89-6 | Iron | 13100 | | E | P |
| 7439-92-1 | Lead | 773 | | *E | P |
| 7439-95-4 | Magnesium | 282 | J | E | P |
| 7439-96-5 | Manganese | 69.6 | | NE | P |
| 7439-97-6 | Mercury | | | | NR |
| 7440-02-0 | Nickel | 0.46 | J | | P |
| 7440-09-7 | Potassium | 973 | | E | P |
| 7782-49-2 | Selenium | 2.5 | J | | P |
| 7440-22-4 | Silver | 6.7 | | N*E | P |
| 7440-23-5 | Sodium | 161 | J | | P |
| 7440-28-0 | Thallium | 2.8 | U | N | P |
| 7440-62-2 | Vanadium | 6.7 | | | P |
| 7440-66-6 | Zinc | 45.0 | | N*E | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: BROWN  Clarity Before:  Texture: MEDIUM

Color After: YELLOW  Clarity After:  Artifacts:

Comments:



SL 9/7/11
9 ~~923~~

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MH30H8

Lab Name: Sentinel  Contract: EPW09040

Lab Code: SENTIN  Case No.: 41730  Mod. Ref. No.  SDG No.: MH30H7

Matrix: (soil/water) SOIL  Lab Sample ID: 16156

% Solids: 90.7  Date Received: 09/02/2011

Concentration Units (ug/L, ug, or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 1970 | | *E | P |
| 7440-36-0 | Antimony | 1.6 | J | NE | P |
| 7440-38-2 | Arsenic | 18.1 | | | P |
| 7440-39-3 | Barium | 115 | | E | P |
| 7440-41-7 | Beryllium | 0.077 | J | | P |
| 7440-43-9 | Cadmium | 1.4 | | * | P |
| 7440-70-2 | Calcium | 126 | J | | P |
| 7440-47-3 | Chromium | 1.8 | | | P |
| 7440-48-4 | Cobalt | 1.0 | J | | P |
| 7440-50-8 | Copper | 67.2 | | N*E | P |
| 7439-89-6 | Iron | 32900 | | ED | P |
| 7439-92-1 | Lead | 1250 | | *ED | P |
| 7439-95-4 | Magnesium | 397 | J | E | P |
| 7439-96-5 | Manganese | 171 | | NE | P |
| 7439-97-6 | Mercury | | | | NR |
| 7440-02-0 | Nickel | 0.76 | J | | P |
| 7440-09-7 | Potassium | 3320 | | E | P |
| 7782-49-2 | Selenium | 8.1 | | | P |
| 7440-22-4 | Silver | 5.8 | | N*E | P |
| 7440-23-5 | Sodium | 196 | J | | P |
| 7440-28-0 | Thallium | 2.8 | U | N | P |
| 7440-62-2 | Vanadium | 11.2 | | | P |
| 7440-66-6 | Zinc | 399 | | N*E | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: BROWN  Clarity Before:  Texture: MEDIUM

Color After: YELLOW  Clarity After:  Artifacts:

Comments:



8/9/11
10-924

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MH30H9

Lab Name: Sentinel Contract: EPW09040

Lab Code: SENTIN Case No.: 41730 Mod. Ref. No. SDG No.: MH30H7

Matrix: (soil/water) SOIL Lab Sample ID: 16157

% Solids: 92.0 Date Received: 09/02/2011

Concentration Units (ug/L, ug, or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 1010 | | *E | P |
| 7440-36-0 | Antimony | 3.6 | J | NE | P |
| 7440-38-2 | Arsenic | 7.5 | | | P |
| 7440-39-3 | Barium | 28.4 | | E | P |
| 7440-41-7 | Beryllium | 0.083 | J | | P |
| 7440-43-9 | Cadmium | 0.43 | J | * | P |
| 7440-70-2 | Calcium | 133 | J | | P |
| 7440-47-3 | Chromium | 0.64 | J | | P |
| 7440-48-4 | Cobalt | 1.1 | J | | P |
| 7440-50-8 | Copper | 84.2 | | N*E | P |
| 7439-89-6 | Iron | 11300 | | E | P |
| 7439-92-1 | Lead | 1500 | | *ED | P |
| 7439-95-4 | Magnesium | 146 | J | E | P |
| 7439-96-5 | Manganese | 91.2 | | NE | P |
| 7439-97-6 | Mercury | | | | NR |
| 7440-02-0 | Nickel | 0.80 | J | | P |
| 7440-09-7 | Potassium | 844 | | E | P |
| 7782-49-2 | Selenium | 1.9 | J | | P |
| 7440-22-4 | Silver | 10.1 | | N*E | P |
| 7440-23-5 | Sodium | 173 | J | | P |
| 7440-28-0 | Thallium | 2.7 | U | N | P |
| 7440-62-2 | Vanadium | 5.6 | | | P |
| 7440-66-6 | Zinc | 89.3 | | N*E | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:



8 9/7/11
11 ~~925~~

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MH30J0

Lab Name: Sentinel  Contract: EPW09040

Lab Code: SENTIN  Case No.: 41730  Mod. Ref. No.  SDG No.: MH30H7

Matrix: (soil/water) SOIL  Lab Sample ID: 16158

% Solids: 93.2  Date Received: 09/02/2011

Concentration Units (ug/L, ug, or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 1010 | | *E | P |
| 7440-36-0 | Antimony | 3.5 | J | NE | P |
| 7440-38-2 | Arsenic | 4.7 | | | P |
| 7440-39-3 | Barium | 23.8 | | E | P |
| 7440-41-7 | Beryllium | 0.060 | J | | P |
| 7440-43-9 | Cadmium | 0.83 | | * | P |
| 7440-70-2 | Calcium | 110 | J | | P |
| 7440-47-3 | Chromium | 0.50 | J | | P |
| 7440-48-4 | Cobalt | 0.29 | J | | P |
| 7440-50-8 | Copper | 192 | | N*E | P |
| 7439-89-6 | Iron | 9680 | | E | P |
| 7439-92-1 | Lead | 454 | | *E | P |
| 7439-95-4 | Magnesium | 313 | J | E | P |
| 7439-96-5 | Manganese | 49.0 | | NE | P |
| 7439-97-6 | Mercury | | | | NR |
| 7440-02-0 | Nickel | 0.25 | J | | P |
| 7440-09-7 | Potassium | 810 | | E | P |
| 7782-49-2 | Selenium | 2.1 | J | | P |
| 7440-22-4 | Silver | 7.3 | | N*E | P |
| 7440-23-5 | Sodium | 140 | J | | P |
| 7440-28-0 | Thallium | 2.7 | U | N | P |
| 7440-62-2 | Vanadium | 2.9 | J | | P |
| 7440-66-6 | Zinc | 186 | | N*E | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: BROWN  Clarity Before:  Texture: MEDIUM

Color After: YELLOW  Clarity After:  Artifacts:

Comments:



9/7/11

12-026

# APPENDIX C

# Project Field Logbook

B. Haynes August 22, 2011

0700 Meet for orientation meeting.
0745 H&S meeting
B Heathcurst & Jeff Miller - slip/trip-falls-driving-lightening
0800 Arrive County Assessor's Office to search property records. Work with Dan Salazar
1000 Send list of property/claim owners via FAX to Sabrina Forrest.
1030 Arrive Mogul complex. Examine geology and mine containment.
Quartz-sericite association.
Iron staining in waters
wetlands in vicinity.
1500 Explain potential issues in wetland delineation to Susan Hall
1535 lunch break and return calls to Sabrina Forrest
1600 Arrive Molas Lake campground to get permission to hike to Elk Park. Parking and access OK.
1630 Return to cement creek to look at Red & Bonita and Gold King 7 level Mines
1730 Hike up to Gold King 7 Level Mine
Observe pile, run-on, Run-off controls, volume stream, observed release at base of pile.
1900 Return to Silverton.

B. Haughurst August 23, 2011

0700 Meet for early AM meeting
B. Haughurst, J. Miller, S. Hall, Jeff Dawson

0705 Answer Sabrina's calls

0710 Call office

0730 Meet with Susan Hall and Jeff Dawson
Give them Sabrina's tele #s in case of emergency

0830 Call Sabrina about taking extra samples
from waste pile at Gold King 7 level waste pile

0900 Drive to Molas lake
Weather clear, cool, no real wind
Task - hike down to Elk Park to document
Fishery use

0900 H:S meeting B Haughurst & J. Miller
slip-trips-falls, sunscreen, water hazard
aggressive individuals, wildlife, drinking & food.
Rain gear, first aid training, no cell phone
avoid cliff edges, be aware of surrounding when
taking photos.

0920 Begin hiking down to Elk Park.

1130 Arrive at Elk Park
Begin searching for fishermen and evidence
of fishing. Moving southward along east
bank of river. Flow rapid, islands, but
no pools to invite fishing. Iron Stained

[redacted]

August 23, 2011

on rocks with annual high flow limit.
11:40 Train passes en route to Silverton
11:48 Second train passes en route to Silverton
12:20 Arrive at south end of Elk Park
Talk to four young boys working on railroad as a crew. They say people take the train up to go fishing, but the people usually fish from the south end of Elk Park downstream to Needleton — The water in Elk park is too swift for fishing. Talk to a camper who also echos this information.
12:30 Find a fishing lure/hook in a tree — take a photograph
1300 Retrace steps northward towards Silverton past Colorado Trail bridge — no evidence of fishermen, No evidence of casual fishing.
1330 Hike from Elk Park to Molas Lake.
1600 Drive to Silverton
1620 Check in Outdoor shops for leads to document fishing on Animas/Lake
1700 Stop for Day

B. Haythorn

August 24, 2011

0700 Meet with URS deliverator crew
They have additional properties that they would like access to. We will check at courthouse after 8:00 Am

0745 Call Office and Sabrina Forrest.

0800 Arrive at Accessors Office
Talk to Dan Salazar
Claims below Moqui Mine in Wetland are largely owned by San Juan Minerals and Salem minerals. (AKA Todd Hewitt)
Rob the Ranter, Yreka, Theresa, Gold Point
Henry M. Teller, Golden Eagle.
Lucky Jim and Ajax owned by Kerr McGee corp
P.O. Box 268859
Oklahoma City, OK 73126

0900 H&S meeting. B. Haythorn & Jeff Miller
down, safety / sunscreen / bugs / slip trips - falls
Weather clear partially cloudy

0930 Meet with deliverators about access issues

1000 Arrive at Red Bonita Mine to define PPE.

1100 Take photos of R&B mine - top, flow out, view to west. Photos of PPE into cement creek.
Flow division clear vs stain. Flow under road into sedgey area. No plant growth

[redacted]

B. Hagner

Aug 24, 2011

stream divides, main flow north ⅔ flow south.
photos of PPE
1200 wait at Silverton train station to interview
train staff about letting off people at Elk Park

San Juan ~~Staff~~ Backcountry
Land Office
Geologic Atlas — "Economic Geology"
Silverton Folio
1905
upper Potosi volcanic series
flows tuffs of qtz, biotite rhyolite
lower Silverton Volcanic series
andesite, rhyolite

1330 Frank Ciancei - Conductor Durango Silverton RR.
21 years — one drop-off ('family') - fishing
Seen fishermen 5 or 6 times.
1400 Ron Dewitz - volunteer with Forest Service @ Public Land Center
no known tourist fishing activity
occasional hear of someone catching on Animas south of town
"Wyatt" Judge Skinner - Melanie - dispatcher @ sheriff's office
1500 Locate American Tunnel outlet to Cement Creek
and photograph.
1545 Locate Gold King 7 Level PPE to Cement Creek and photograph
1615 Locate Mogul outlet to Cement Creek (PPE) and photogram
1700 Return to Silverton.

[redacted]

B. Hughes August 25, 2011

0700 Meet with URS delineation team.
Pick-up GPS unit and pass on information about access at Moguel wetlands and lack of access at Gladstone.
URS anticipates leaving Sunday mid-day.
Call Sabrina about access to sphagnum moss area.
TASKS for Thursday: 1) GPS PPE's ~~to~~ to Cement Creek for
1) Grand Moguel mine
2) Moguel mine
3) Gold King 7 level Mine
4) Red & Bonita Mine
5) American Tunnel
2) Collect samples from Gold King 7 Level Mine and determine dimensions of waste pile
0800 Weather – cool, clear, with clouds to south.
0900 Talk to Sabrina Forrest about access around Moguel mine and Gladstone. We have access to wetlands below Moguel and along creek at Gladstone – to look for sphagnum moss
0915 Tell URS delineation crew about access.
0930 H&S meeting. B. Hughes & J. Miller
Thunder lightening, Nails, sunscreen, slip trip falls

[redacted]

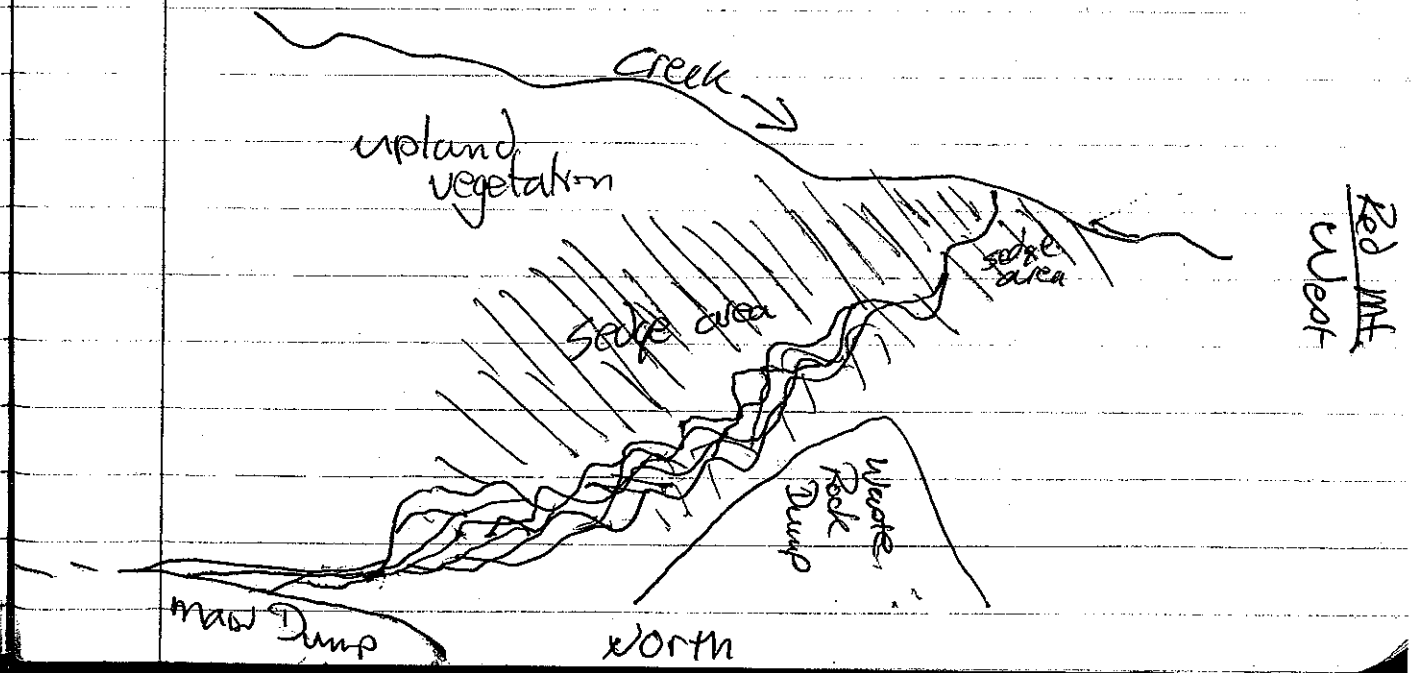
R. Hoglund August 25, 2011

0935 Leave for Grand Mogul.

1000 Take GPS & PPE @ Grand Mogul into creek. Note precipitation of iron at PPE, Al in mine stream. Area vegetated by sedges (golden colored vegetation). Area previously identified as wetland based upon vegetation, however hydrophilic soils not present.

1015 Mineralogy noted in mine dump. Quartz-pyrite association - milky quartz with veins and fracture coatings of poorly formed pyrite crystals. Mineral Assemblage - quartz with pyritic veins. Country rock fg volcanic with Fe oxide iron staining. Fine grained material is mineralized and altered quartz, feldspar with limonite staining.

Sketch of Drainage from Grand Mogul



B. Hagar August 25, 2011

Mogul Mine

11:00 Photo of adit with adit discharge. Geotextile fabric for about 50 ft. Some leakage to waste rock pile on eastern (mountain) side (Photo). Geotextile fabric absent from flow path (photos). Flows over mix of waste rock, lumber, and natural colluvium. Flows across surface of road down drainage into wetlands below Mogul Mine (photos).

Mineralogy: Quartz (milky) and pyritic veins present, but on smaller scale. Waste rock seems to be more altered with limonite staining

Photo of PPE from Mogul into creek staining of rocks

11:50 Pile of waste rock (angular fresh quartz-pyritic vein material and freshly broken country rock dumped off side of road into wetland. Flow of wetland stream along front of waste pile.

1215 Move to Rod & Bonita PPE's.

PPE-1 most upstream & 2/3rds flow

PPE-2 downstream 1/3 flow

The waste rock pile is covered by an armoring patina of ferric oxides scattered pieces of waste rock found about the site

[redacted]

R. Hagen August 25, 2011

include the quartz-pyrite veined material

1350 Move to Gold King 7 Level Mine PPEs into Cement Creek.

PPE01 upstream ~ 1/4

PPE02 downstream ~ 3/4

Photos of PPEs into Cement Creek

1410 Move to American Tunnel PPE.

Photos of PPE.

1430 Break for lunch a telephone message check

1500 Call Sabrina — checkin

1600 Arrive at Gold King 7 Level Mine dump.

Innov-X ~~Hand~~ Systems

Model OS~~8~~D-4000 # 70047

Standard 316 cps - 64081

Resolution 148 eVolts

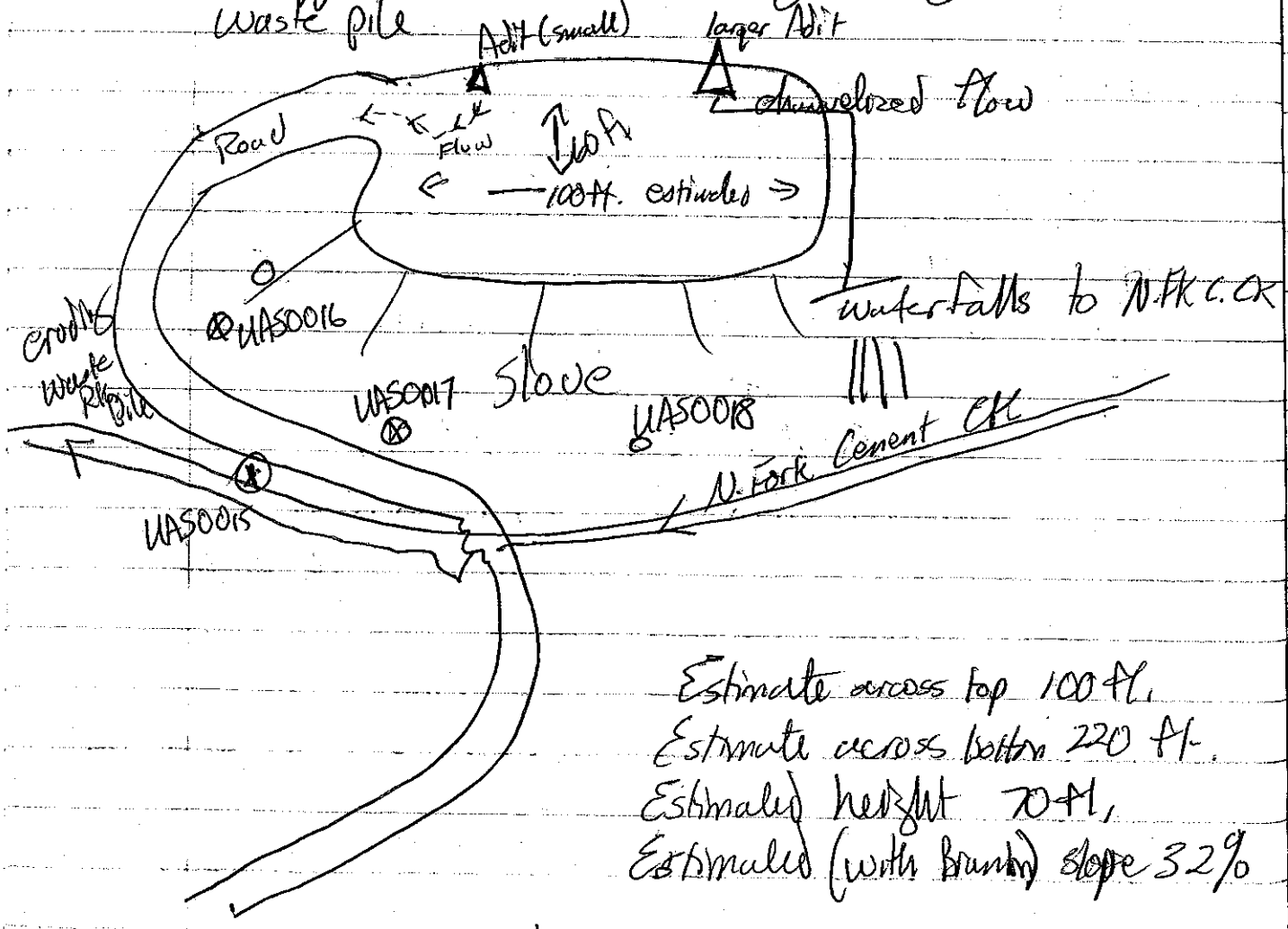
XRF Field In Situ shots

| # | Pb | As | Cd | Time | Desc |
|---|---|---|---|---|---|
| 1 | 734 | 33 | <37 | 1620 | med gran (on 2 |
| 2 | 977 | 57 | <29 | 1627 | " " |
| 3 | 2980 | 168 | <29 | 1631 | fine grain yellow |
| 4 | 2952 | 166 | <30 | 1635 | " " " |
| 6 | 654 | 28 | <24 | 1639 | mixed |
| 7 | 4520 | 175 | <26 | 1640 | fg gran yellow |
| 8 | 458 | 40 | <29 | 1650 | white, med g |
| 9 | 474 | 34 | <40 | 1652 | " " |

8/25/11

# Calculations for Volume of Gold King 7 Level Mine

Jeff take GPS area/line of top of waste pile




Estimate across top 100 ft.
Estimate across bottom 220 ft.
Estimated height 70 ft.
Estimated (with branch) slope 32%

8/25/11

11

| # | Pb | As | Cd | Time | Descrp |
|---|---|---|---|---|---|
| 10 | 173 | 68 | <30 | 1730 | poorlysorted Red |
| 11 | 626 | 47 | <24 | 1735 | yellow, fg |
| 12 | 665 | 50 | <25 | 1740 | Duplicate |

1735 Take a presumed background

| | | | | | |
|---|---|---|---|---|---|
| 1735 | 1446 | 51 | <27 | 1735 | Brown, mixed |

Complete field XRF

The ~~tailings~~/mine waste rock in the dump can be divided in three rough groupings.

1 - a medium to coarse grained, well sorted orange limonite stained material with lead < 1,000 ppm and arsenic < 100 ppm

2 - a medium to fine grained limonite stained material with lead between 2,000 and 4,000 ppm and arsenic ≥ 100 ppm.

3 - a medium to coarse poorly sorted quartz-white with sulphides (pkyrite). Pb < 500 ppm, As < 50 ppm

Will collect a sample of each of these three characteristic waste rock types plus a 4th sample of the #2 type where it is being actively eroded by the stream.

1750 Collect sample UAS095 from toe of (GK7LS01) Gold King 7 Level waste rock dump where the medium to coarse grained limonite stained material is

R. Hager August 25, 2016

being actively eroded by the N. Fork of
Cement Creek. See Photos
1805 Collect waste rock sample UASC016 (GK7LS02)
from medium grained material - See Photo
1815 Collect waste rock sample UASC017 (GK7LS03)
from limonite stained material
1830 Collect waste rock sample UASC018 (GK7LS04)
from quartz (white) sulfide material.
1915 Leave Gold King 7 Level mine dump
2000 Arrive Silverton

B. Haynes

Aug 26, 2014

0700 Meet with UBS delineation crew - review work and schedule - no problems, should be finished by late Saturday

0730 H&S Meeting - B. Haynhurst, J. Miller slip-trips-fall, weather, driving safety and River awareness while looking for fishermen

0800 Check by Animas River below Silverton for evidence of fishermen or fishing - none observed

1400 Recheck Animas River below Silverton for evidence of fishing activity - none observed

1500 Depart Silverton for Denver.